REMARKS

Claims 12 to 15 and 21 to 28 were rejected under 35 U.S.C. §102(b) as being anticipated by WO 01/50477 to Hesketh et al. (hereinafter "Hesketh"). Claims 12 to 15 and 21 to 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hesketh either alone or in view of either one of U.S. Patent No. 4,652,416 to Millot (hereinafter "Millot") or U.S. Patent No. 4,326,922 to Ferrari et al. (hereinafter "Ferrari"). Claims 16 to 20 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hesketh either alone or in view of U.S. Patent No. 4,224,106 to Delafosse (hereinafter "Delafosse"). Claims 12 to 15 and 21 to 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over EP 0 196 655 to Ohashi et al. (hereinafter "Ohashi") in view of Hesketh alone or further in view of U.S. Patent No. 3,366,546 to Anthony et al. (hereinafter "Anthony"). Claims 16 to 20 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ohashi in view of Hesketh alone or further in view of Anthony, and where necessary, further in view of Delafosse.

Claims 12, 14 and 22 have been amended to correct clerical errors.

Reconsideration of the application based on the following remarks is respectfully requested.

35 U.S.C. §102 Rejections

Claims 12 to 15 and 21 to 28 were rejected under 35 U.S.C. §102(b) as being anticipated by Hesketh.

Hesketh discloses a "mixed oxide fuel assembly for a nuclear reactor in which the fuel assembly comprises a plurality of fuel rods, a largest diameter fuel rod type, a smallest diameter fuel rod type, and one or more intermediate size fuel rod types being provided." (Abstract). Hesketh also discloses that "the core may include mixed oxide fuel assemblies and uranium dioxide fuel assemblies." (Page 5, lines 27 to 28).

Claims 12 and 22 recite in part "the fuel rods containing uranium which is enriched in isotope 235 and not containing any plutonium before the assembly is used in a reactor, wherein the rods are distributed in at least:

a first central group which is constituted by fuel rods which have a first level of nuclear reactivity; and

an outer peripheral layer of fuel rods distributed in:

a second group of fuel rods that extend along faces of the outer contour of the network and that have a second level of nuclear reactivity that is strictly less than the first level of nuclear reactivity; and

a third group of fuel rods that are arranged at corners of the outer contour of the network and that have a third level of nuclear reactivity that is strictly less than the second level of nuclear reactivity."

In Hesketh, only fuel rods containing plutonium are shown in Fig. 4 which is used to reject claims 12 and 22. (See Hesketh page 9, lines 1 to 4 and page 7, lines 7 to 8). Where in Hesketh is it shown or disclosed that a *UO_2 assembly* is in a first central group and in a second central group as claimed? The Final Office Action asserts that "Fig. 4, in Hesketh, which refers to mixed oxide fuel, is the preferred form of this invention. The uranium dioxide fuel, which Hesketh himself admits as suitable for his core, can be a non-preferred form of the invention."

There is simply no basis in Hesketh to contend that uranium dioxide fuel could be a non-preferred form of the invention.

The sole mention of non MOX fuel assemblies in Hesketh is at page 5, lines 27 to 28, in which Hesketh states "[t]he core may include mixed oxide fuel assemblies and uranium dioxide fuel assemblies." This in no way indicates that UO_2 fuel assemblies would meet the limitations of claims 12 and 22 in the first and second central group.

While MOX assemblies are often zoned, no prior art, including Hesketh, teaches or shows zoning *UO_2 assemblies as claimed*. The Final Office Action asserts on page 3 that "the previously applied references teach the claimed zoning of UO_2 assemblies." Applicant fails to see such teachings. Hesketh does not teach or show "fuel rods containing uranium which is enriched in isotope 235 and not containing any plutonium before the assembly is used in a reactor" being "distributed in at least: a first central group which is constituted by fuel rods which have a first level of nuclear reactivity; and an outer peripheral layer of fuel

rods distributed in: a second group of fuel rods that extend along faces of the outer contour of the network and that have a second level of nuclear reactivity that is strictly less than the first level of nuclear reactivity; and a third group of fuel rods that are arranged at corners of the outer contour of the network and that have a third level of nuclear reactivity that is strictly less than the second level of nuclear reactivity." Hesketh does not teach using UO_2 assemblies alone, but only teaches UO_2 assemblies being in the core with the zoned MOX assemblies and does not teach or suggest any specific distribution for the UO_2 assemblies. (See Hesketh, table 1). Therefore, Hesketh fails to teach or show all limitations of claims 12 and 22.

Withdrawal of the rejection to claims 12 to 15 and 21 to 28 under 35 U.S.C. §102(b) is respectfully requested.

35 U.S.C. §103 Rejections

Claims 12 to 15 and 21 to 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hesketh either alone or in view of either one of Millot or Ferrari.

Hesketh is discussed above.

Millot discloses "a fuel assembly for a pressurized water nuclear reactor consisting of a cluster of parallel fuel rods." (Col. 2, lines 22 to 24). "[T]he fuel assembly comprises: a peripheral zone consisting of a first group of rods containing mainly uranium oxide enriched in fissile uranium so as to emit neutrons and to maintain the neutron reaction, spaced so that the layer of moderating water is sufficient to bring the neutrons into the thermal region, and a central zone consisting of a second group of rods containing mainly plutonium and/ or uranium depleted in fissile uranium and spaced by a distance which is appreciably smaller than the distance separating the rods in the peripheral zone." (Col. 2, lines 33 to 44).

Ferrari discloses a composite nuclear fuel assembly "which allows higher coolant operating temperatures and enhanced utilization of mixed-oxide fuels. It also provides addirional design flexibility. In one embodiment it provides a vertically oriented assembly of elongated fuel rods of two differing diameters. The upper portion of the assembly includes

rods of a smaller diameter than rods of the lower portion of the assembly." (Col 1, line 65 to col. 2, line 4).

Claims 12 and 22 recite in part "a second group of fuel rods that extend along faces of the outer contour of the network and that have a second level of nuclear reactivity that is strictly less than the first level of nuclear reactivity; and a third group of fuel rods that are arranged at corners of the outer contour of the network and that have a third level of nuclear reactivity that is strictly less than the second level of nuclear reactivity."

As discussed above, in Hesketh, only fuel rods containing plutonium are shown in Fig. 4 which is used to reject claims 12 and 22. (See Hesketh page 9, lines 1 to 4 and page 7, lines 7 to 8). Where in Hesketh is it shown or disclosed that *UO_2 assemblies* are in a first central group and in a second central group as claimed? The sole mention of non MOX fuel assemblies is at page 5, lines 27 to 28, in which Hesketh states "[t]he core may include mixed oxide fuel assemblies and uranium dioxide fuel assemblies." Moreover, this in no way indicates that UO_2 fuel assemblies would meet the limitations of claims 12 and 22.

While MOX assemblies often are zoned, no prior art, including Hesketh, teaches or shows zoning UO_2 assemblies as claimed. This is made clear in Hesketh. "The nature of MOX fuel...causes difficulties if a single enrichment is used throughout the fuel assembly...To counter these difficulties a system of different enrichment zones within the assembly of identical diameter fuel rods is used with edge rods having a lower enrichment than core rods...Whilst operating problems are overcome to an extent with this type of arrangement the manufacturing problems are significantly increased. A fuel assembly for any given reactor core now necessitates the production of at least three different enrichments of MOX....The present invention addresses this problem by eliminating or reducing the need for different enrichments." (Hesketh page 7, line 27 to page 8, line 16). In the prior art, including, Hesketh, PWR fuel assembly zoning has only been used with MOX fuel, in order to compensate for difficulties arising from the nature of MOX fuel. There is simply no teaching or motivation for such configurations being beneficial to UO_2 PWR fuel assemblies. Thus, Hesketh does not teach or show "fuel rods containing uranium which is enriched in isotope 235 and not containing any plutonium before the assembly is used in a reactor" being

"distributed in at least: a first central group which is constituted by fuel rods which have a first level of nuclear reactivity; and an outer peripheral layer of fuel rods distributed in: a second group of fuel rods that extend along faces of the outer contour of the network and that have a second level of nuclear reactivity that is strictly less than the first level of nuclear reactivity; and a third group of fuel rods that are arranged at corners of the outer contour of the network and that have a third level of nuclear reactivity that is strictly less than the second level of nuclear reactivity." Hesketh only teaches UO_2 assemblies being in the core with the zoned MOX assemblies and does not teach or suggest any specific distribution for the UO_2 assemblies. (See Hesketh, table 1). Furthermore, neither Millot nor Ferrari teach or show the limitations discussed above, nor does the Office Action assert they do.

Withdrawal of the rejection to claims 12 to 15 and 21 to 28 under 35 U.S.C. §103(a) is respectfully requested.

Claims 16 to 20 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hesketh either alone or in view of Delafosse.

Hesketh is discussed above.

Delafosse discloses a plate type nuclear fuel element.

Claims 16 to 20 and 29 are directly and indirectly dependent on claim 12. In light of the discussion above regarding claim 12 and Hesketh, withdrawal of the rejection to claims 16 to 20 and 29 is respectfully requested.

Furthermore, claim 17 recites "wherein the rods of the first group have a first level of enrichment e1 in uranium 235, the rods in the second group have a second level of enrichment e2 in uranium 235 strictly less than the first level of enrichment e1 and the rods of the third group have a third level of enrichment e3 in uranium 235 that is strictly less than the second level of enrichment e2."

Neither Hesketh nor Delafosse teach or show "the rods in the second group have a second level of enrichment e2 in uranium 235 strictly less than the first level of enrichment e1 and the rods of the third group have a third level of enrichment e3 in uranium 235 that is

strictly less than the second level of enrichment e2," as recited in claim 17, and the Office Action fails to address such a limitation.

Withdrawal of the rejection of claim 17 for this additional reason is respectfully requested.

Claims 12 to 15 and 21 to 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ohashi in view of Hesketh alone or further in view Anthony.

Ohashi discloses a fuel assembly adapted to be loaded in the core of a nuclear fuel reactor.

Hesketh is discussed above.

Anthony discloses a nuclear reactor arrangement employing thin control rods and control rod channels thereby eliminating the necessity for rod followers. (Col. 3, lines 7 to 9).

Claims 12 and 22 recite in part "fuel rods which are arranged at nodes of a substantially regular network having a polygonal outer contour, the fuel rods containing uranium which is enriched in isotope 235 and not containing any plutonium before the assembly is used in a reactor, wherein the rods are distributed in at least:

a first central group which is constituted by fuel rods which have a first level of nuclear reactivity; and

an outer peripheral layer of fuel rods distributed in:

a second group of fuel rods that extend along faces of the outer contour of the network and that have a second level of nuclear reactivity that is strictly less than the first level of nuclear reactivity; and

a third group of fuel rods that are arranged at corners of the outer contour of the network and that have a third level of nuclear reactivity that is strictly less than the second level of nuclear reactivity."

Both Ohashi and Hesketh fail to teach or show "fuel rods containing uranium which is enriched in isotope 235 and not containing any plutonium before the assembly is used in a reactor " being "distributed in at least: a first central group which is constituted by fuel rods which have a first level of nuclear reactivity; and an outer peripheral layer of fuel rods

distributed in: a second group of fuel rods that extend along faces of the outer contour of the network and that have a second level of nuclear reactivity that is strictly less than the first level of nuclear reactivity; and a third group of fuel rods that are arranged at corners of the outer contour of the network and that have a third level of nuclear reactivity that is strictly less than the second level of nuclear reactivity."

The failure of Hesketh to meet the limitations of claims 12 and 22 is discussed above.

The Office Action on page 5 cites to Ohashi Fig.6 for teaching the "first central group" and "second central group" and then asserts that Ohashi "discloses that the fuel for the fuel assembly can be slightly enriched uranium dioxide only" citing to page 13, line 24+ of Ohashi. However the cited page 13 of Ohashi is in reference to Figure 1. Clearly this paragraph conveys no teaching with respect to the fuel assembly of Fig. 6 and the Office Action reasoning is ill founded. Moreover, the quoted passage does not convey the information that only slightly enriched uranium dioxide should be used, but rather that slightly enriched uranium dioxide should be used simultaneously with MOX, which is consistent with the low content of U235 in the "slightly enriched uranium." (See table 1). Indeed, in the corresponding embodiment of Fig. 1, slightly enriched uranium dioxide and MOX are used simultaneously.

Withdrawal of the rejection to claims 12 to 15 and 21 to 28 under 35 U.S.C. §103(a) is respectfully requested.

Claims 16 to 20 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ohashi in view of Hesketh alone or further in view of Anthony, and where necessary, further in view of Delafosse.

Ohashi, Hesketh, Anthony and Delafosse are discussed above.

Claims 16 to 20 and 29 are directly and indirectly dependent on claim 12. As discussed above both Ohashi and Hesketh fail to teach or show "fuel rods containing uranium which is enriched in isotope 235 and not containing any plutonium before the assembly is used in a reactor" being "distributed in at least: a first central group which is constituted by fuel rods which have a first level of nuclear reactivity; and an outer peripheral layer of fuel

rods distributed in: a second group of fuel rods that extend along faces of the outer contour of the network and that have a second level of nuclear reactivity that is strictly less than the first level of nuclear reactivity; and a third group of fuel rods that are arranged at corners of the outer contour of the network and that have a third level of nuclear reactivity that is strictly less than the second level of nuclear reactivity."

Furthermore, not only do Ohashi and Hesketh not teach such zoned configurations in UO_2 in PWR assemblies, they instead clearly teach away from the different zoning enrichments of claim 16 by teaching different fuel rod diameters. (See Ohashi, pages 2 and 3; See Hesketh, page 1, 3rd paragraph last sentence and 4th and 5th paragraphs).

Withdrawal of the rejection to claims 16 to 20 and 29 under 35 U.S.C. §103(a) is respectfully requested.

CONCLUSION

It is respectfully submitted that the application is in condition for allowance and applicants respectfully request such action.

If any additional fees are deemed to be due at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

Respectfully submitted,
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